

Insect stings and bites - not only hymenoptera







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Zuerich, Switzerland



Insect bites and stings

Most common allergenes

Clinical features

Cross-reactivity

Management





Insect bites and stings

Pain /Local reaction

Allergy

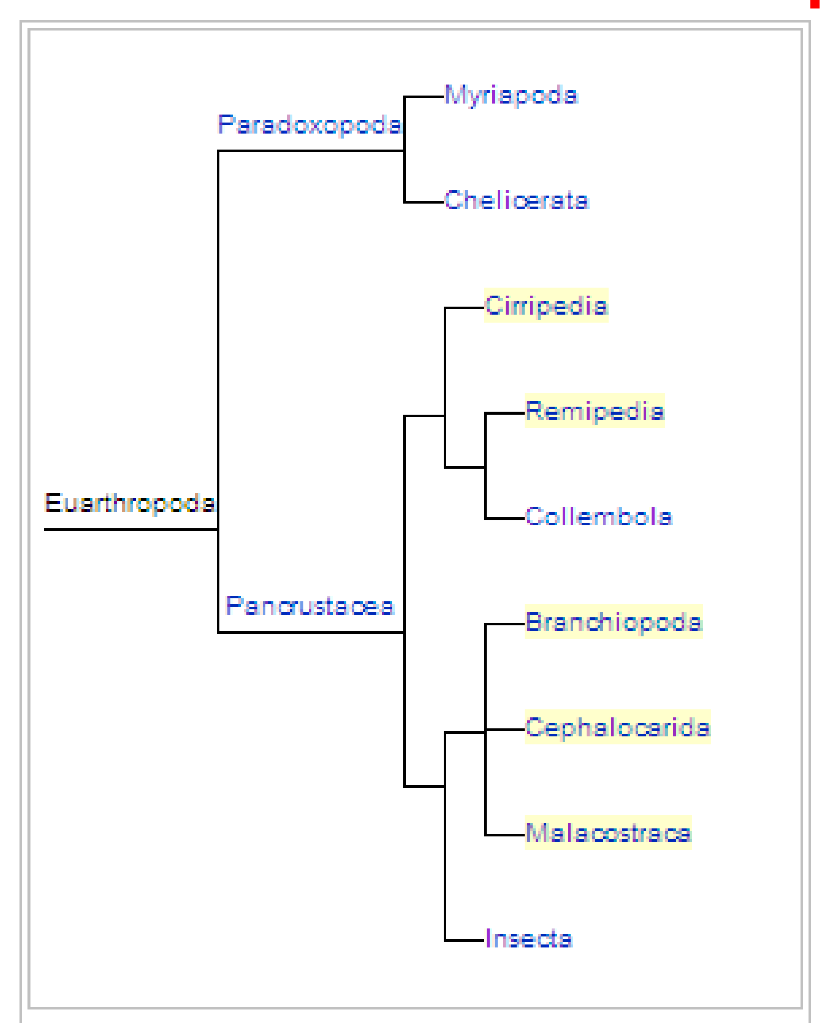
Infections / Transmission







Arthropods



Arthropods

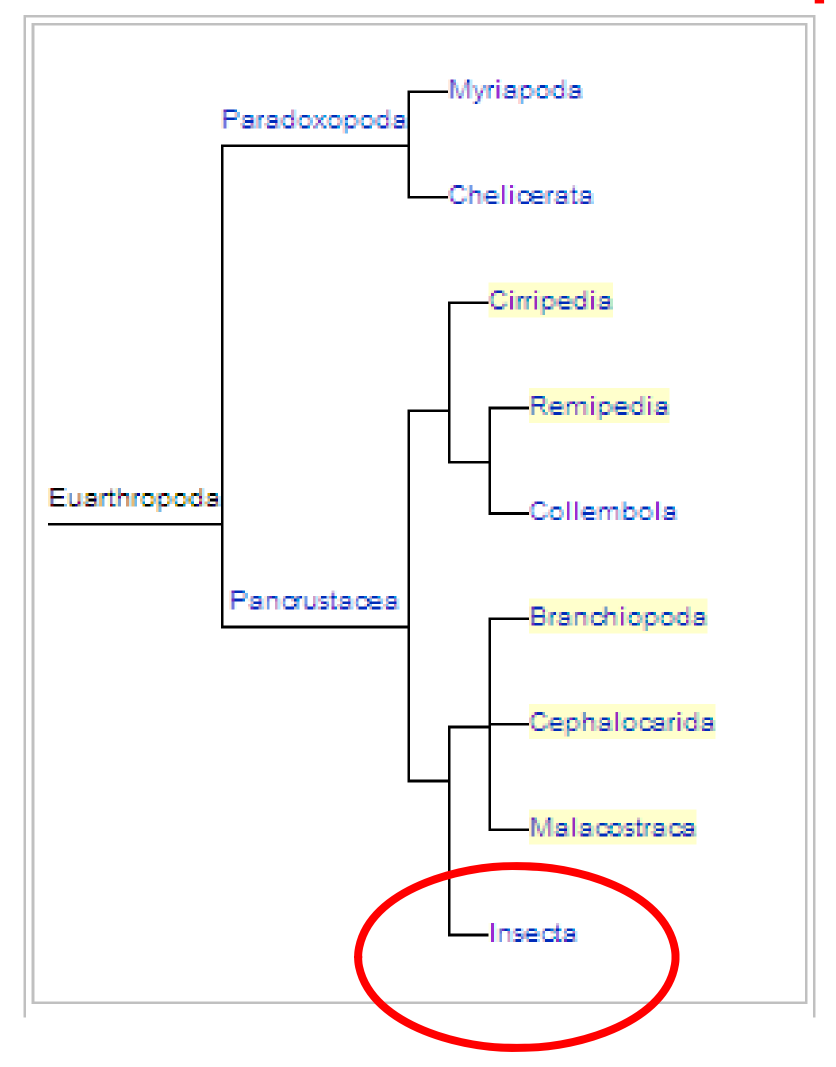
Fossil range: 530–0 Ma



Cambrian – Recent



Arthropods



Spiders, Mites, Ticks, Scorpions

Centipeds, Millipeds



Crustaceae

Shrimps, Crabs, Lobster, Crabfish, Woodlice





Nocturnal asthma

Feeling of stings/bites







Bites of the European pigeon tick (*Argas reflexus*): Risk of IgE-mediated sensitizations and anaphylactic reactions

Jörg Kleine-Tebbe, MD,[a] Anja Heinatz, MD,[a] Inken Gräser, MD,[a] Hans Dautel, PhD,[b] Gitte Nordskov Hansen, BSc,[c] Sabine Kespohl, PhD,[d] Hans-Peter Rihs, PhD,[d] Monika Raulf-Heimsoth, PhD,[d] Günther Vater, PhD,[e] Manfred Rytter, MD,[a] and Uwe-Fritjof Haustein, MD[a] *Leipzig, Berlin, and Bochum, Germany, and Hørsholm, Denmark*



J Allergy Clin Immmunol 2007

Allergy to pigeon tick (Argas reflexus)

TABLE I. LRs and SRs after a bite of the pigeon tick *Argas reflexus* in 148 subjects (37 atopics, 24%, and 111 nonatopics)

	Frequency	
Symptoms	**n**	**%**
Local	146	99
Redness	142	96
Local itching	124	84
Inflammatory node	93	63
Lymphatic secretion	36	24
Wheal	25	17
Pruritic secretion	20	14
Lymphangitis	12	8
Lymph node swelling	10	7
Vesicle	10	7
Systemic	12	8
Urticaria	11	7
Angioedema	6	4
Vascular dysregulation	2	1
Dyspnea	7	5
Unconsciousness	4	3
Gastrointestinal symptoms	3	2
Rush with pruritus	**3**	**2**

Mostly local reaction

About 8% systemic

J Allergy Clin Immmunol 2007


HOW TO SHIT ON PEDESTRIANS
IN ONLY 12 LESSONS

Arthropods

Insects



6 legs

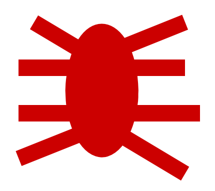
Flies

Mosquitos etc

Hymenoptera

Bee, Wasp, Ants

Arachnoidea



8 legs

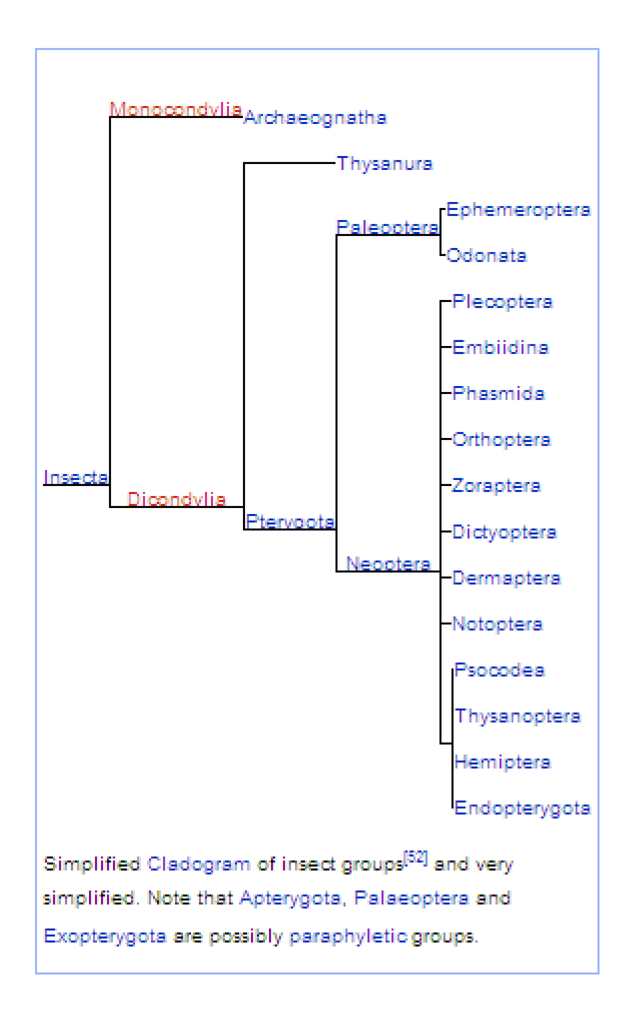
Spiders

Ticks

Scorpions

Insects





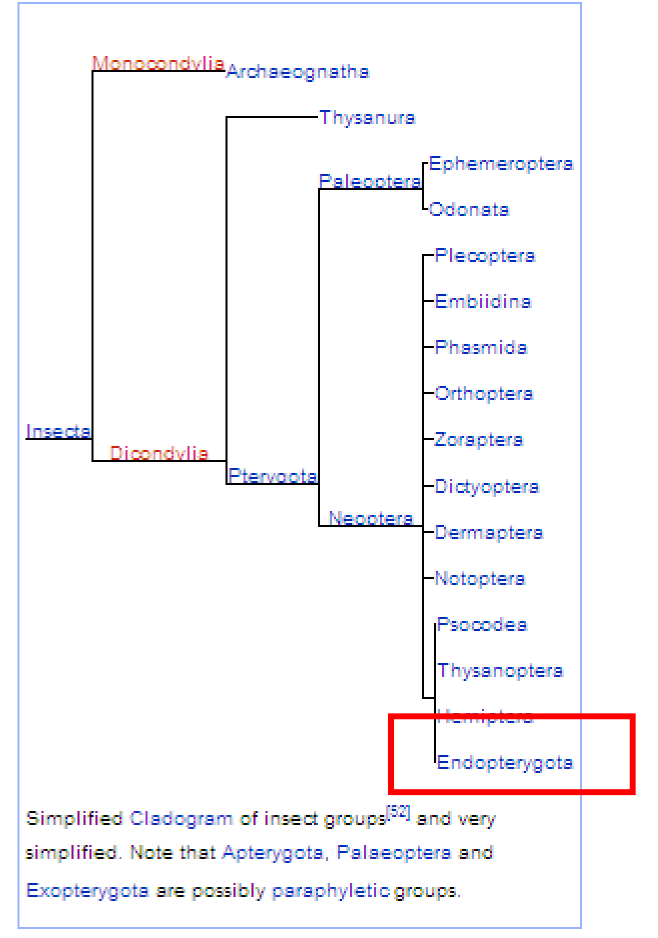
Simplified Cladogram of insect groups[52] and very simplified. Note that Apterygota, Palaeoptera and Exopterygota are possibly paraphyletic groups.

6- 7 Mio Species

About 1 Mio known

- 170‘000 butterflies

> 350‘000 beetles



Simplified Cladogram of insect groups[52] and very simplified. Note that Apterygota, Palaeoptera and Exopterygota are possibly paraphyletic groups.





- Hymenoptera (ants, bees, etc.)
- Coleoptera (beetles)
- Strepsiptera (twisted-winged parasites)

K.U, m, 29-j.



Campingholidays in Florida, USA

Feeling of „insect bites“

Suddenly Urticaria, Sweating, Dyspnoe

Hospital admission



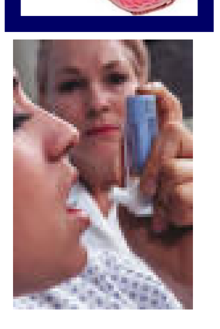
Severity of Anaphylaxis (H.L. Muller)

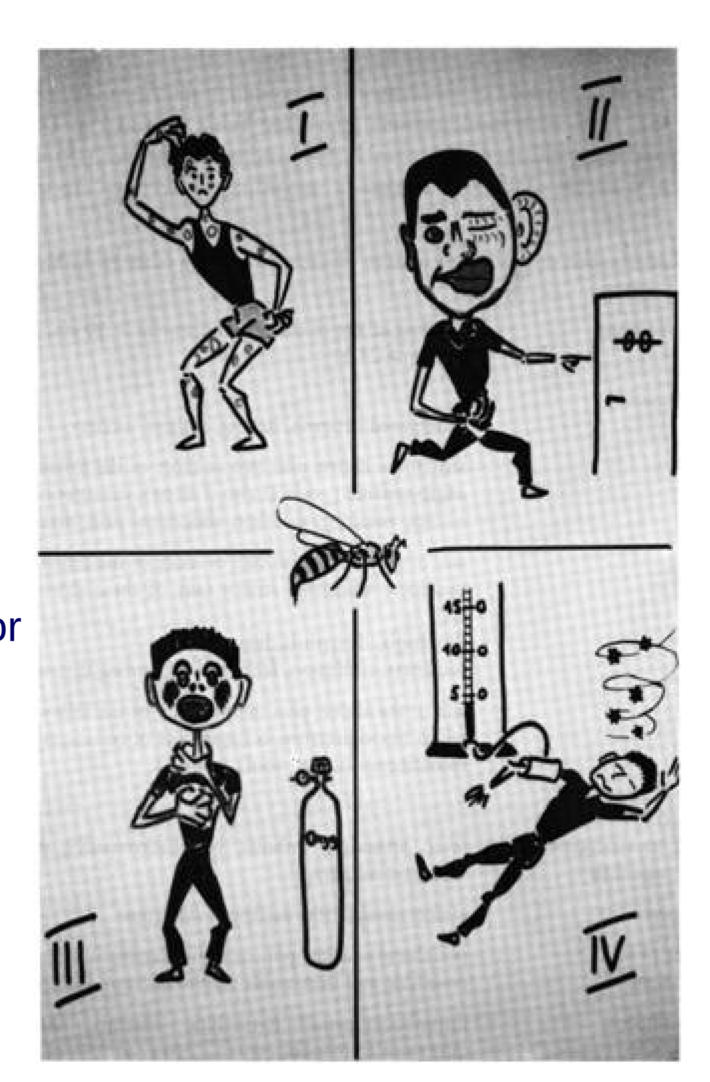
Grade I — Urticaria

Grade II  — Angio-Edema, Nausea, Vomiting, Diarrhöe

Grade III — Dyspnoa, Cough, Stridor Dysphagia, Weakness, Confusion

Grade IV — Hypotension, Kollaps,Incontinence Loss of consciousness, Cyanosis





K.U, m, 29-j.

Allergologic work up

	Bee	Wasp	**Imported Red Fire ant**
Spec IgE in Serum			
Class	0	2	3
kU/l		0.98	1.89
Intradermal skin test		pos. at 1.0 ug/ml	
Normal		1.0	


Red imported fire ant

Red **imported** fire ant
Solenopsis invicta

Originally from **Brazil**



Mato Grosso









Red **imported** fire ant
Solenopsis invicta

Originally from **Brazil**

Mato Grosso













Red imported fire ant
Solenopsis invicta

Originally from **Brazil**

Around 1940 **Southern USA**







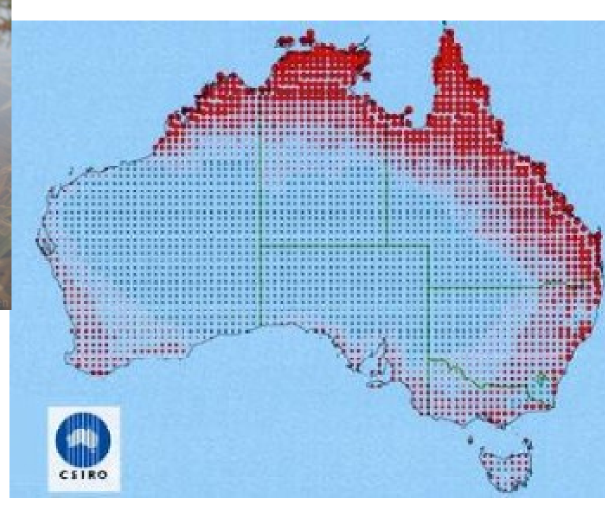
Red imported fire ant
Solenopsis invicta

Originally from **Brazil**

Around 1940 **Southern USA** / **Australia**

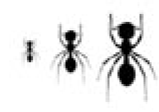






Red imported fire ant are not the largest ants

Comparison of ant sizes



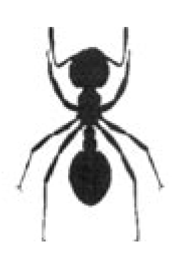
Fire ant
Solenopsis invicta



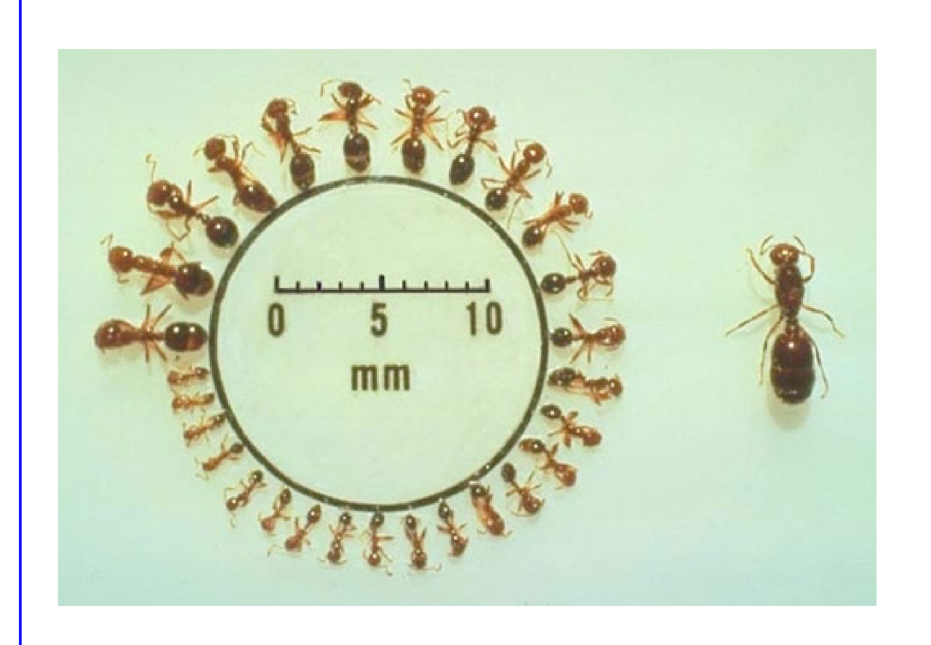
Black ant
Iridonmyrmex 'rufoniger'



Sugar ant
Camponotus sp.



Bull ant
Myrmecia sp.



2- 6 mm

Red imported fire ant

but

- spread fast
- are invasive and extinct other ants
- are aggressive

Meet the Fire Ant: An Introduction to an Exotic Pest

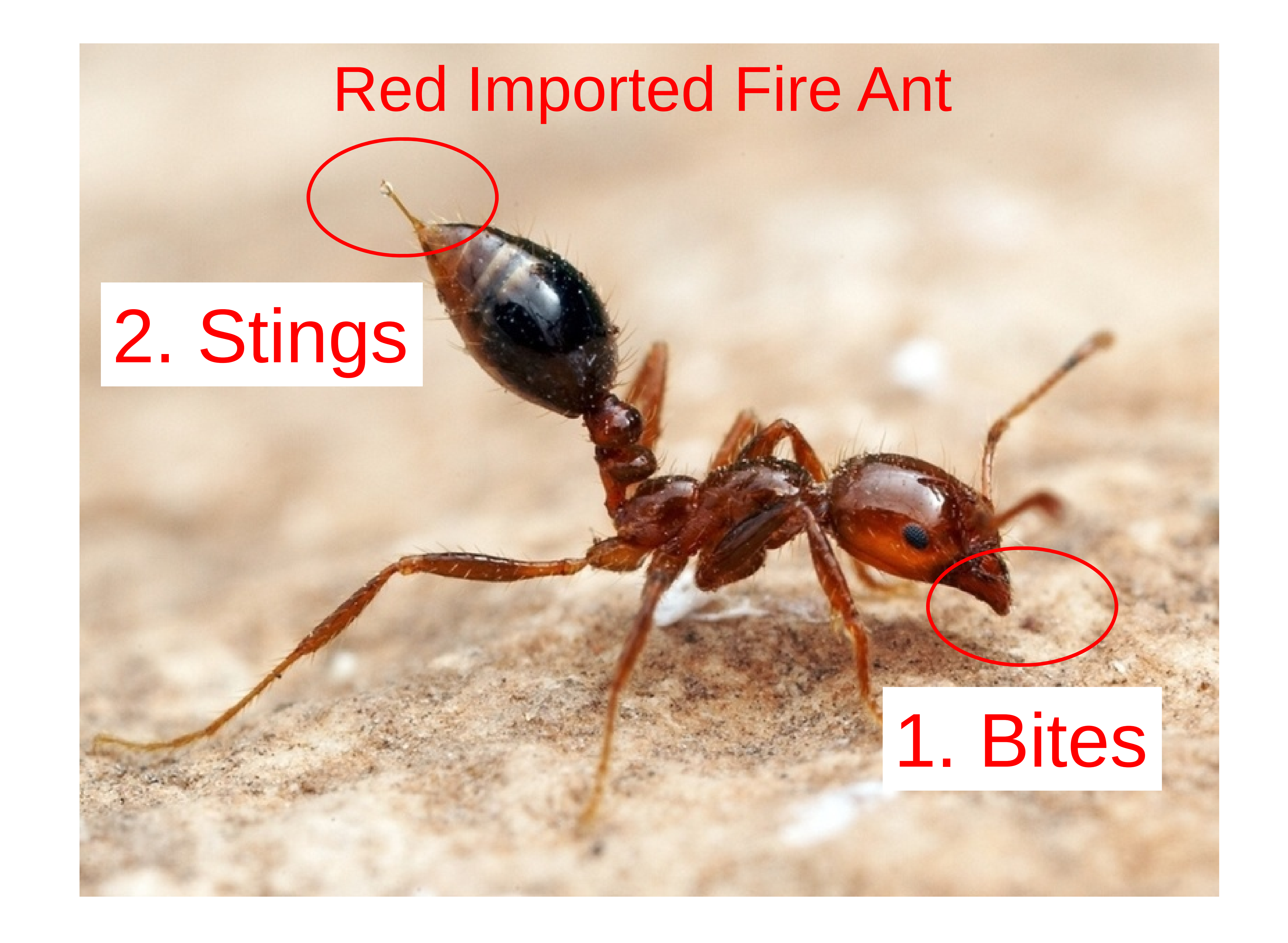
Megan Bame

Pest animals

The term 'pest animal' refers to any exotic animal, which causes a detrimental impact on the environment, industry or community activities.

Pest species may come from any animal group including mammals, birds, fish, reptiles, amphibians, crustaceans, molluscs and insects.


Fire Ant #12
ORANGE COUNTY
RED IMPORTED FIRE ANT
COOPERATIVE PROJECT
FIRE ANT AUTHORITY


Red Imported Fire Ant
2. Stings
1. Bites

Red Imported Fire Ant

2. Stings







1. Bites


Talk to us
before
you take
another
step.
GREENUP
Kaboom!

Allergy to RFA (H.L. Muller)

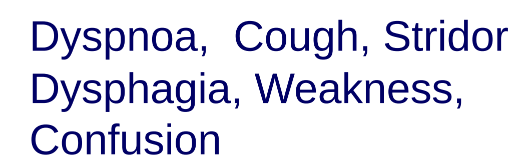
Grade I 



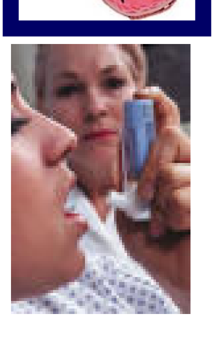
Urticaria

Grade II 

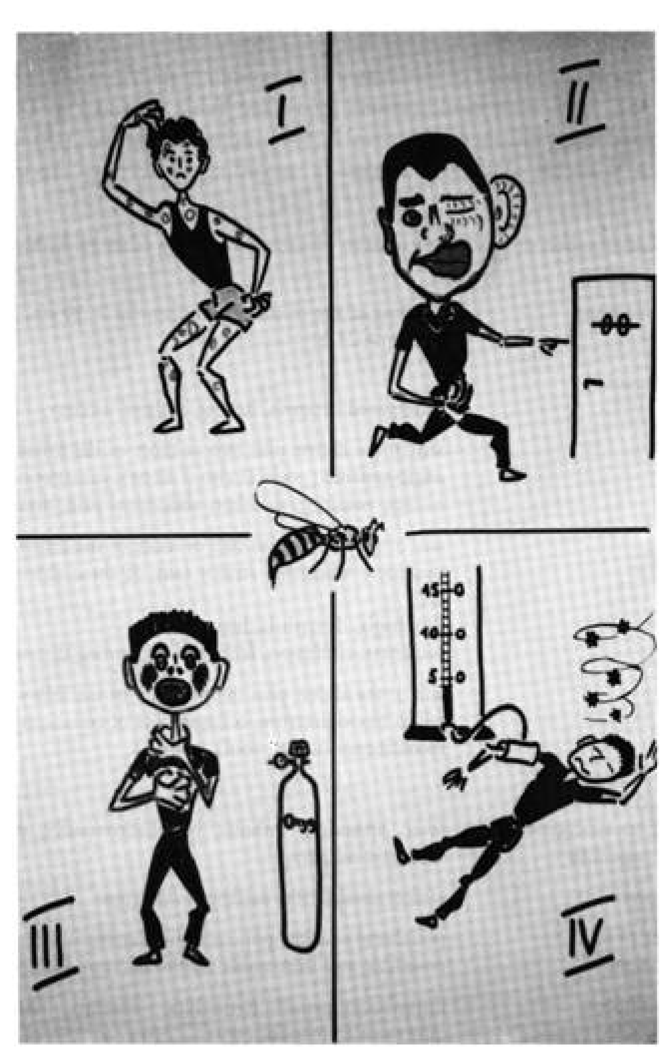
Angio-Edema, Nausea,
Vomiting,
Diarrhöe

Grade III 

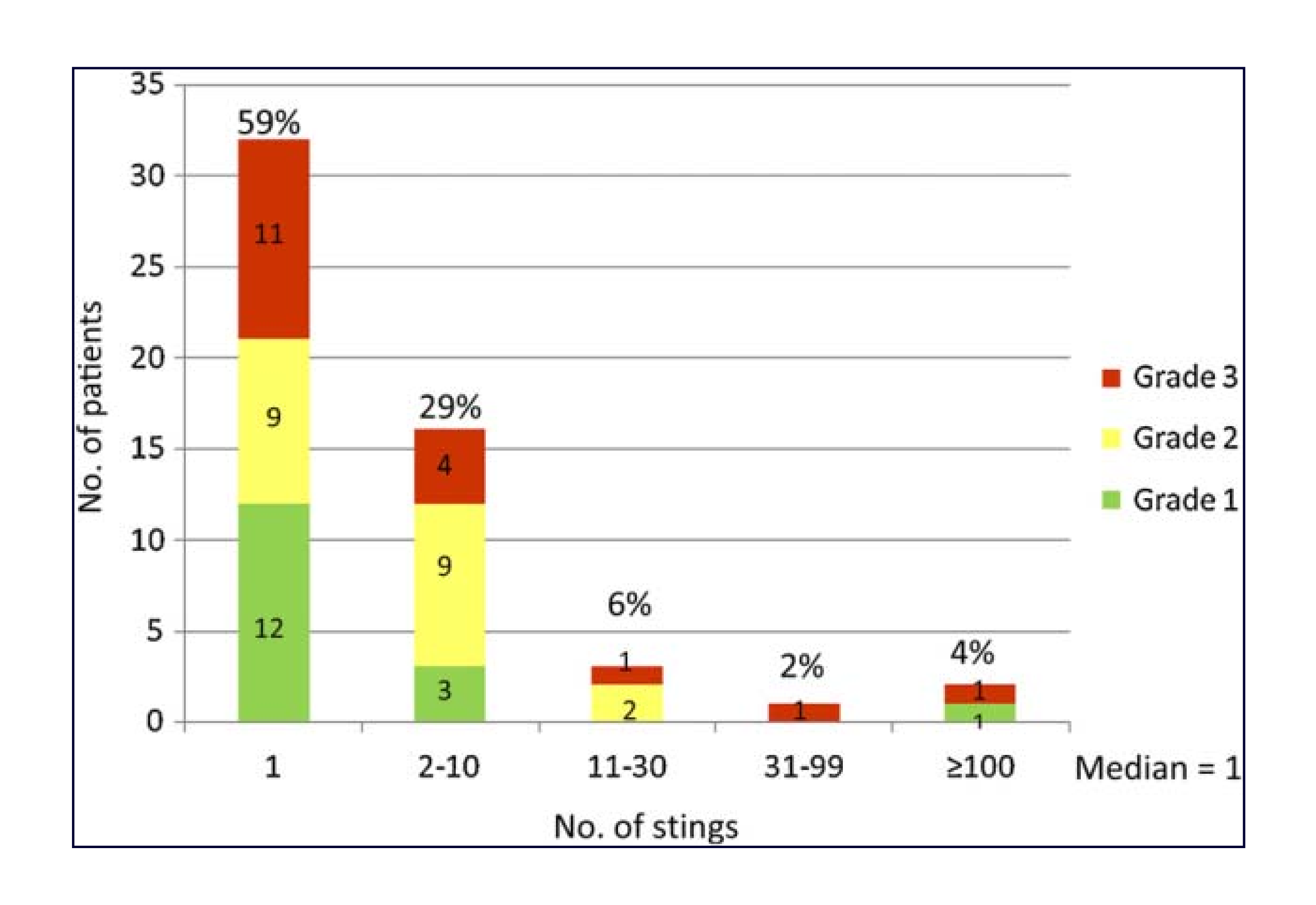
Dyspnoa, Cough, Stridor
Dysphagia, Weakness,
Confusion

Grade IV 

Hypotension,
Kollaps,Incontinence
Loss of consciousness,
Cyanosis



Allergic reactions to RFA often occur at early stings



La Shell M et al J Allergy Clin Immunol 2010;125:1294-9

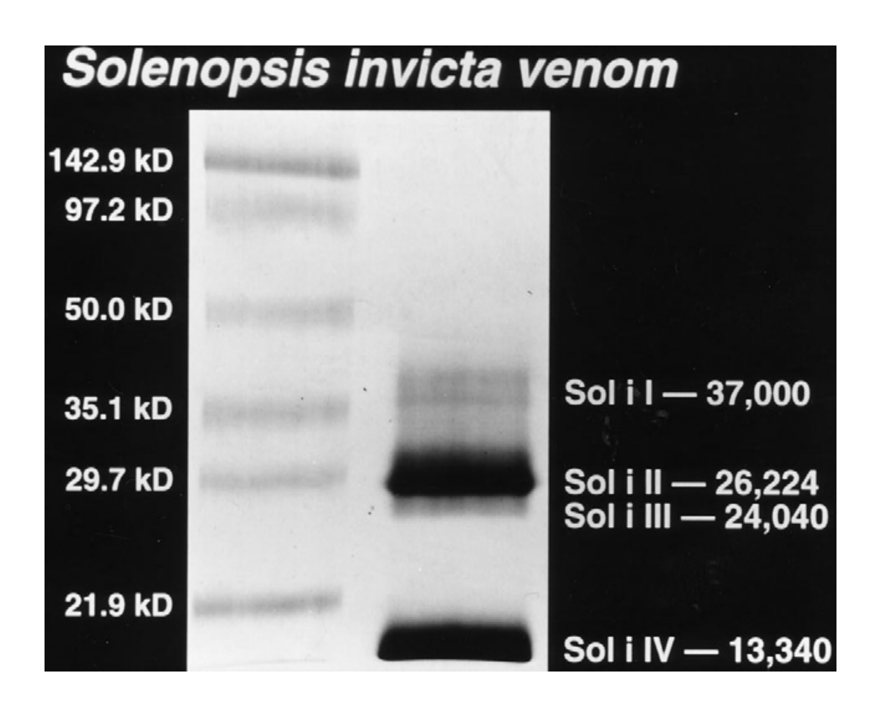
Allergens of RFA

Sol i 1

Sol i 2

Sol i 3

Sol i 4



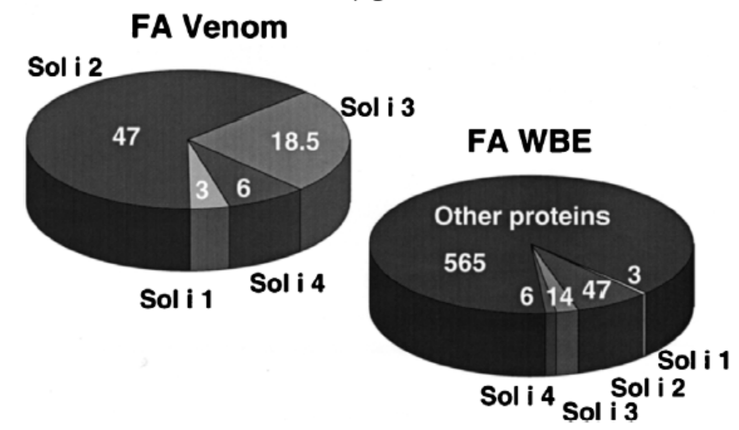


Figure 4. *Left*: Concentration Sol i allergens in fire ant venom. *Right*: Sol i allergen concentration compared to relatively large amount of extraneous body protein in fire ant whole body extract.

Hoffman DR et l J Allergy Clin Immunol 1988;82:828-34

Stafford T. Ann Allergy Asthma Immunol 1996;77:87–99.

Allergens of RFA

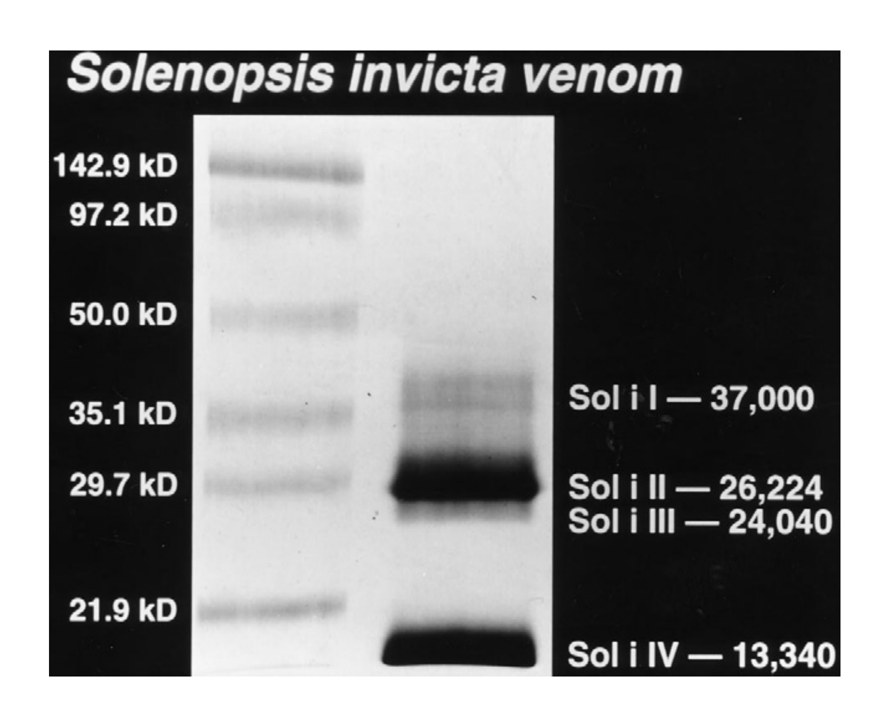
Sol i 1 Phospholipase
cross-reacts with Wasps

Sol i 2 specific for Solenopsis

Sol i 3

Sol i 4 specific for Solenopsis

Hoffman DR et l J Allergy Clin Immunol 1988;82:828-34
Stafford T. Ann Allergy Asthma Immunol 1996;77:87–99.



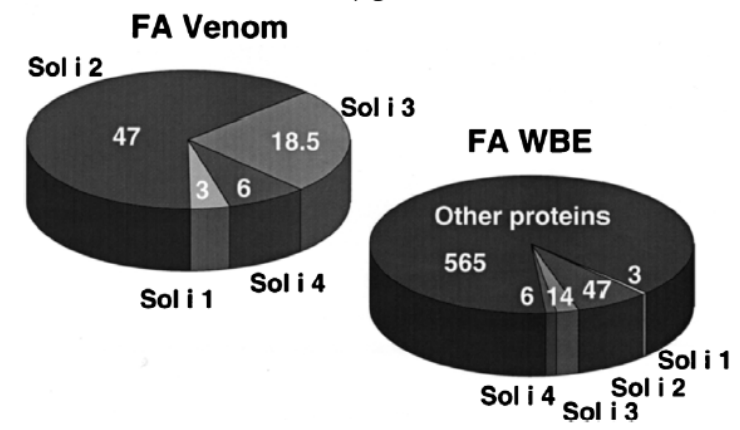


Figure 4. *Left*: Concentration Sol i allergens in fire ant venom. *Right*: Sol i allergen concentration compared to relatively large amount of extraneous body protein in fire ant whole body extract.

RFA

Diagnosis of Allergy

Specific IgE in Serum

ImmunoCAP Code**: i70**



Source material: Whole body extract

Skin tests



Prick test (Commercial extracts)

Intradermal tests (Commercial extracts)

Source material: Whole body extract

Solley Med J Aust 2002; 176: 518

La Shell M et al J Allergy Clin Immunol 2010;125:1294-9

RFA Treatment

Grad I-II **Emergency kit**

Grad III- IV **Spec. Immunotherapy**

Source material: Whole body extract





Solley Med J Aust 2002; 176: 518

La Shell M et al J Allergy Clin Immunol 2010;125:1294-9

Imported fire ant field reaction and immunotherapy safety characteristics: The IFACS study

Mark S. La Shell, MD,[a] Christopher W. Calabria, MD,[b] and James M. Quinn, MD[b] *Travis Air Force Base, Calif, and Lackland Air Force Base, San Antonio, Tex*

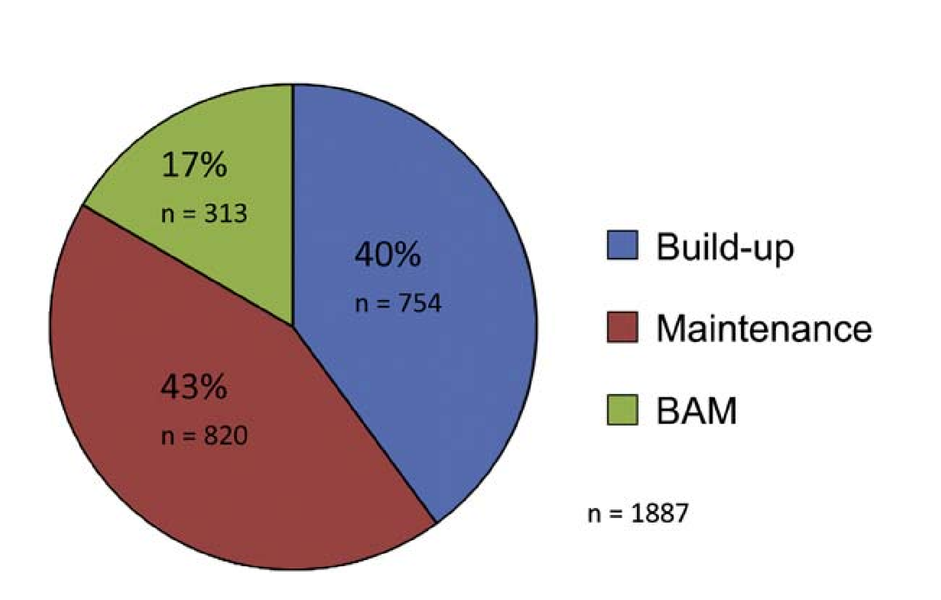


FIG 2. Total injections by phase.

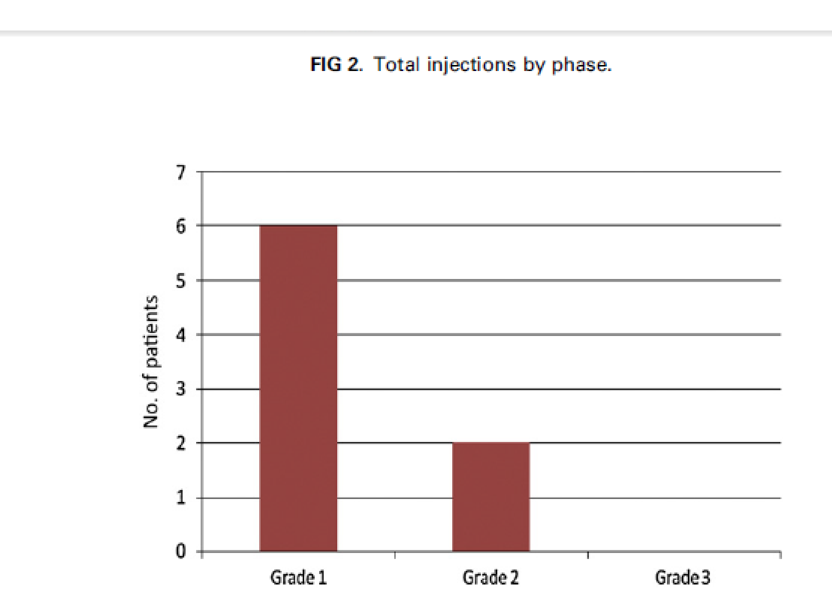


FIG 3. Severity of SRs to IFA SCIT. Seven of 77 patients experienced SRs to IFA SCIT. There were no emergency department visits, hospitalizations, or fatalities. One patient experienced more than 1 SR, and she had a total of 2 SRs, each grade 1. In 2 different patients 2 SRs were delayed (one presented at 35 minutes and the other at 60 minutes).

La Shell M et al J Allergy Clin Immunol 2010;125:1294-9

Imported fire ant field reaction and immunotherapy safety characteristics: The IFACS study

Mark S. La Shell, MD,[a] Christopher W. Calabria, MD,[b] and James M. Quinn, MD[b] *Travis Air Force Base, Calif, and Lackland Air Force Base, San Antonio, Tex*

TABLE III. Risk factors for SRs to IFA SCIT per injection

	SR to IFA SCIT	No SR to IFA SCIT	OR	95% CI
LLR	2 (25%)	18 (1.0%)	34.4*	6.51-182
Asthma	2 (25.0%)	523 (27.8%)	0.87	0.18-4.32
Sex (female)	6 (75%)	1,071 (57.0%)	2.29	0.46-11.4
Age (>50 y)	0 (0%)	666 (35.4%)	0.11	0.01-1.98
ACE inhibitor	0 (0%)	173 (9.21%)	0.62	0.04-10.8
Field reaction†	3 (37.5%)	608 (36.4%)	1.04	0.25-4.39
Maintenance‡	3 (37.5%)	817 (43%)	0.78	0.19-3.27
Build-up and BAM‡	5 (62.5%)	1,062 (59.7%)	1.28	0.31-5.38
Build-up‡	2 (25.0%)	752 (42%)	0.5	0.10-2.48
BAM‡	3 (37.5%)	310 (18%)	3.04	0.72-12.8
SR to ST	3 (37.5%)	175 (11.1%)	4.75*	1.13-20.0
Concentration of ST§	8 (100%)	0 (0%)	4.33	0.25-75.7

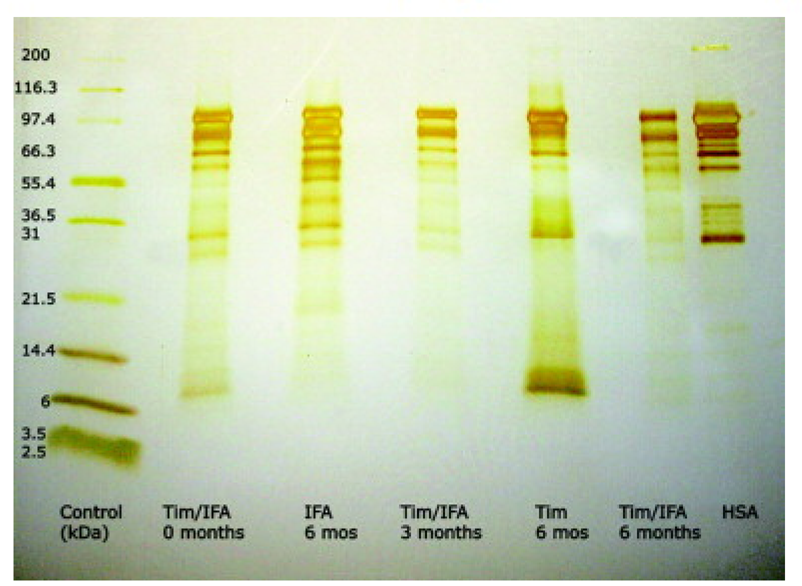
SCIT with RFA WHBE is safe,

but increased risk in patients with LLR

with SR to Skin tests

La Shell M et al J Allergy Clin Immunol 2010;125:1294-9

Compatibility of imported fire ant whole body extract with cat, ragweed, *Dermatophagoides pteronyssinus*, and timothy grass allergens



Conclusions

Imported fire ant whole body extract combined with timothy grass resulted in significant and rapid timothy protein degradation.

Imported fire ant whole body extract mixed with cat, ragweed, or *D pteronyssinus* revealed aeroallergen stability, yielding the possibility of combining these extracts in a single immunotherapy injection**.**

Compatibilities of IFA WBE with other common aeroallergens remain undetermined and thus **are not recommended for single-injection immunotherapy formulations**.

Rans Tet al Ann Allergy Asthma Immunol. 2009;102:57–61.

Red **imported** fire ant
Solenopsis invicta





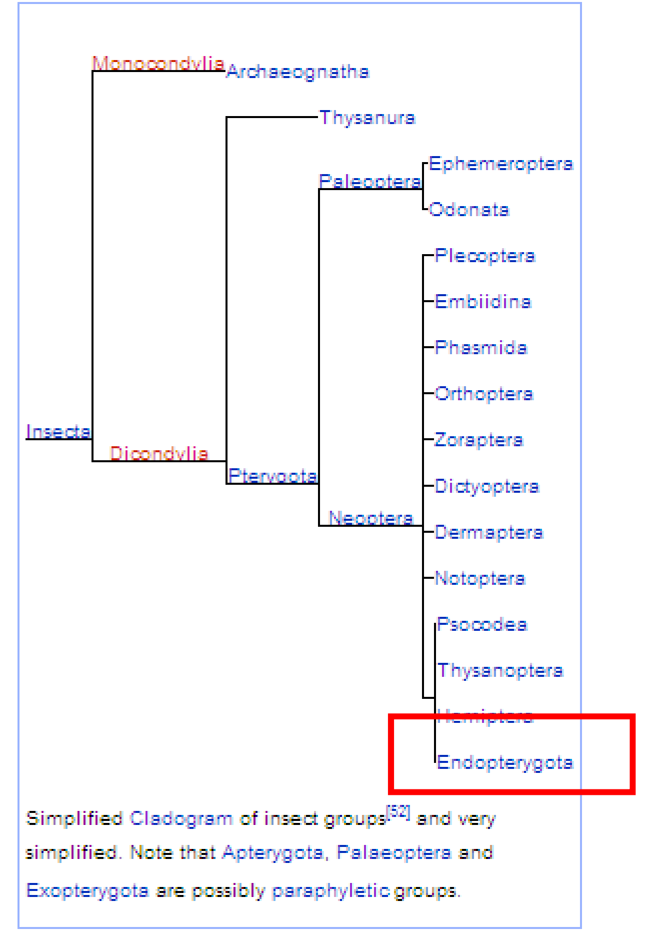
J Invest Allergol Clin Immunol 2006

CASE REPORT

Anaphylaxis Caused by Imported Red Fire Ant Stings in Málaga, Spain

S Fernández-Meléndez,[1] A Miranda,[1] JJ García-González,[1] D Barber,[2] M Lombardero[2]

Due to work with tropical wood imported from Brazil to Spain

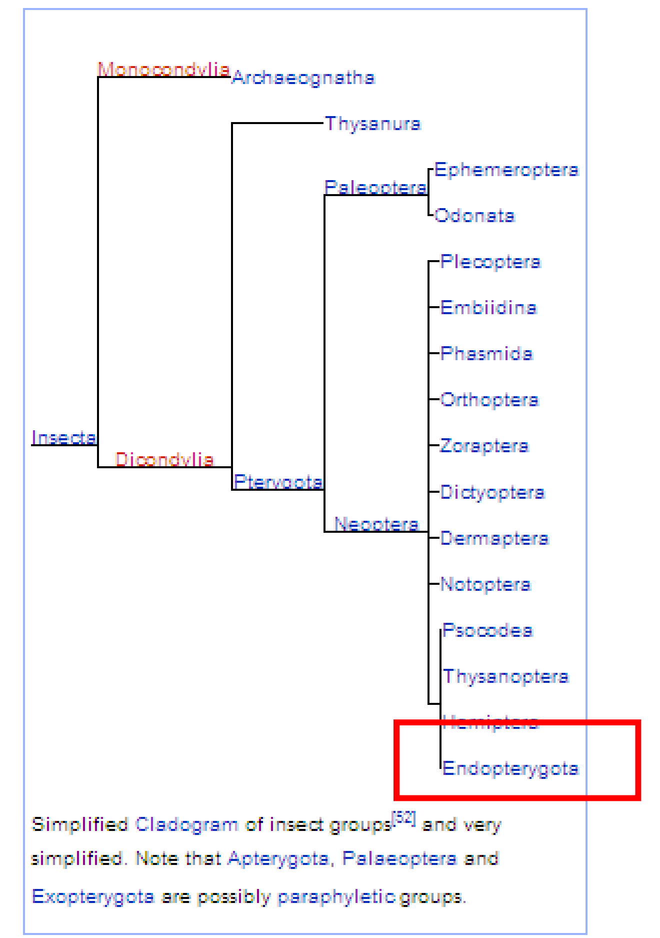


Simplified Cladogram of insect groups[52] and very simplified. Note that Apterygota, Palaeoptera and Exopterygota are possibly paraphyletic groups.





- Hymenoptera (ants, bees, etc.)
- Coleoptera (beetles)
- Strepsiptera (twisted-winged parasites)



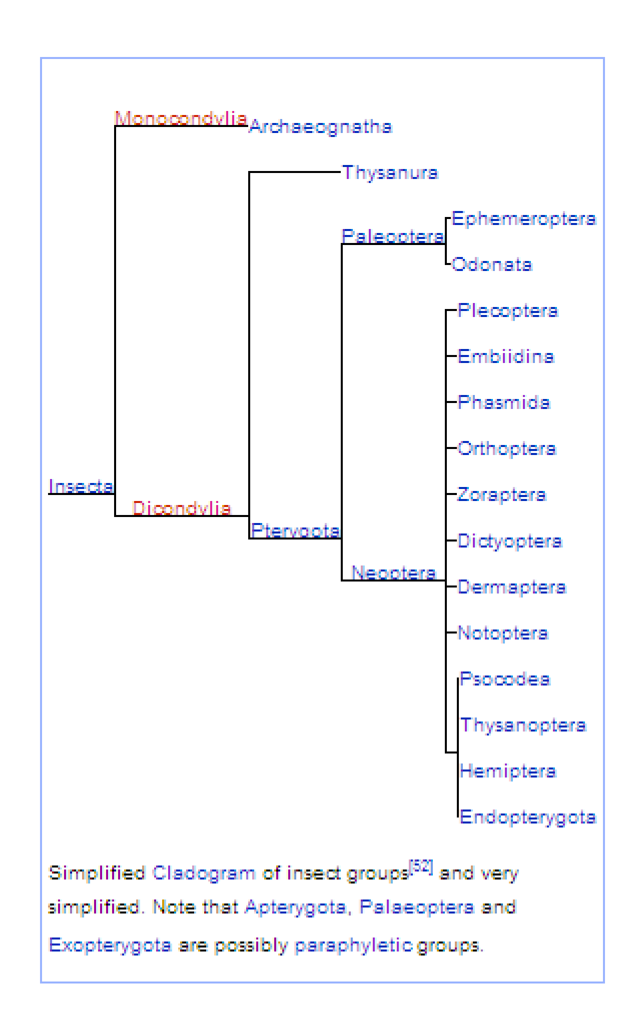
Simplified Cladogram of insect groups[52] and very simplified. Note that Apterygota, Palaeoptera and Exopterygota are possibly paraphyletic groups.





not

- ~~Hymenoptera (ants, bees, etc.)~~
- Coleoptera (beetles)
- Strepsiptera (twisted-winged parasites)



Simplified Cladogram of insect groups[52] and very simplified. Note that Apterygota, Palaeoptera and Exopterygota are possibly paraphyletic groups.



- Hymenoptera (ants, bees, etc.)
- Coleoptera (beetles)
- Strepsiptera (twisted-winged parasites)



Beetle-Dermatitis



Paederus-Species

Cantharidin, Paederin





Harmonia axyridis



Larvae of Harmonia axyridis

Asian ladybugs (*Harmonia axyridis*): A new seasonal indoor allergen

Takuya Nakazawa, MD, PhD,[a] Shama M. Satinover, MS,[a] Lisa Naccara, BA,[a] Lucy Goddard, RN,[a] Bojan P. Dragulev, PhD,[b] Edward Peters, MD,[c] and Thomas A. E. Platts-Mills, MD, PhD[a] *Charlottesville, Va, and Austin, Tex*

TABLE I. Twenty patients reporting symptoms to ALB: environmental exposure and serum IgE antibody levels

	Age (y)/race/sex	Symptoms	Season	Skin test	Household infestation	ALB	IgE antibody (IU/mL)			
							CR	Mite	Cat	Other*
1	46/W/F	Rhinitis, cough	Winter	ND	+++	59	1.5	2.1	Neg	Moth
2	60/W/M	Cough, asthma	Year round	++	++	30	5	10.6	10.6	Grass, moth, Berlin beetle
3	54/W/M	Rhinitis, cough	Winter	++	+++	41	Neg	Neg	Neg	Grass
4	56/W/F	Rhinitis, cough	Winter	ND	++	14	2.3	Neg	Neg	Grass, Berlin beetle
5	57/W/F	Asthma, rhinitis	Winter	++	++	10	0.4	22	8.9	Dog, moth, grass
6	72/W/F	Asthma, rhinitis	Winter	++	++	1.6	0.6	0.4	Neg	Moth‡
7	58/W/F	Cough, conjunctivitis	Winter	++	++	4.1	Neg	Neg	Neg	Neg
8	18/W/M	Rhinitis	Spring	ND	+	Neg	1.5	Neg	Neg	Moth‡
9	47/W/F	Asthma	Fall	++	+++	26	Neg	Neg	Neg	Neg
10	59/W/F	Asthma	Year round	+	++	1.6	2.3	1.8	3.1	Dog, moth, grass, Berlin beetle
11	78/W/F	Asthma	Worse in winter	++	++	0.6	Neg	Neg	Neg	Neg
12	42/W/F	Rhinitis	Spring/fall	ND	+	Neg	Neg	1.2	Neg	Neg
13†	51/W/F	Rhinitis, conjunctivitis	Fall	ND	++	14.5	Neg	Neg	1.0	Neg
14	59/W/F	Chronic cough, rhinitis	Year round	ND	++	0.38	Neg	Neg	Neg	Neg
15	45/W/F	Asthma, rhinitis	Year round	ND	+	0.4	Neg	Neg	Neg	Grass
16	45/W/F	Asthma, hives	Fall	ND	++	Neg	Neg	Neg	Neg	Moth
17	63/W/F	Rhinitis, cough	Winter	ND	+++	3.6	Neg	Neg	Neg	Neg
18	49/W/F	Asthma	Winter	++	++	Neg	Neg	Neg	Neg	Neg
19	39/W/F	Asthma	Year round	ND	+	Neg	Neg	15.2	1.1	Dog, moth
20	34/W/F	Asthma	Year round	++	+++	0.68	0.67	19.6	0.7	Grass, moth

CR, Cockroach; *F*, female; *M*, male; *W*, white.
*Other allergens tested included rye grass, moth, Berlin beetle, and dog.
†Patient #13 reported a large local swelling of the neck after being bitten by a ladybug.
‡The IgE antibody responses to moth included 2 sera with high titer.

Nakazewa J Allergy Clin Immunol 2007

Ladybug - Allergy

History	Work with wheat, Seasonal RCA (winter)
Skin test	Extracts (Not com avail)
IgE	ImmunoCAP
Therapy	Symptomatically Eradification (SIT)



Crossreactivity

Ladybugs and Cockroackes

A — Emergency Room Group (Asthmatics)

r = 0.83,
$p < 0.001$

Anti-Ladybug IgE antibody (IU/ml)

Anti-Cockroach (i6) IgE antibody (IU/ml)

B — Asian Ladybug Group

r = 0.34,
p = 0.15

Anti-Ladybug IgE antibody (IU/ml)

Anti-Cockroach (i6) IgE antibody (IU/ml)

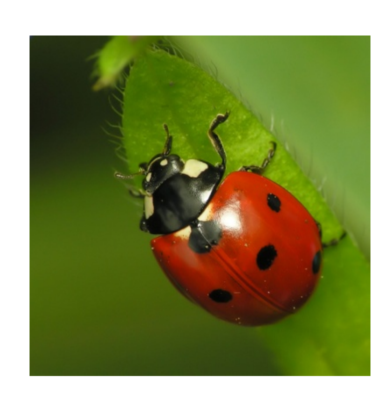
C — Inhibition Assays

% inhibition

no extract, 1:1000, 1:100, 1:10, 1:1

ratio of sera:extract (v/v)

○ Sera from ALB study
● Sera from ER study



Nakazewa J Allergy Clin Immunol 2007

Cockroaches

Cockroaches

German cockroach



Brown-banded cockroach



American cockroach



Australian cockroach



Smoky-brown cockroach



Brown cockroach



Florida woods cockroach



Surinam cockroach



Oriental cockroach



Cuban cockroach



Cockroaches

Current reviews of allergy and clinical immunology

(Supported by a grant from Astra Pharmaceuticals, Westborough, Mass)

Series editor: Harold S. Nelson, MD

Cockroach allergens and asthma

L. Karla Arruda, MD, PhD,[a,b] Lisa D. Vailes, MS,[c] Virginia P. L. Ferriani, MD, PhD,[a] Ana Beatriz R. Santos, BSc,[b] Anna Pomés, PhD,[c] and Martin D. Chapman, PhD[c]

Ribeirão Preto, Brazil, and Charlottesville, Va

Although cockroach allergens are found throughout the house, including beds, furniture, and carpets, the highest levels are typically found in the kitchen, and these levels are perhaps the best indicator of cockroach infestation in a house.[8,14,19] However, exposure in the bedroom and family room may be more relevant in causing sensitization.



J Allergy Clin Immunol 2005





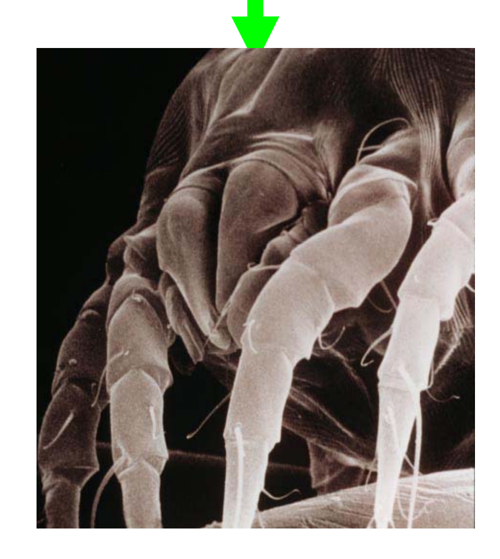
Seafood



Tropomyosin

Pen a 1 u.a.





Cockroaches

Housedust-Mite

Helbling A. Schw Med Wschr 1997
Santos AB, J Allergy Clin Immunol 1997
Kutting B, Brehler R. Hautarzt 2001

Mite-Crustazeae-Syndrome

What's on an allergologist's mind....



Tropomyosin
Pen a 1



Housedust-Mite
Cockroach



Seafood


Red Mosquito - Mite-Crustazeae-Syndrome
What's on an allergologist's mind....
Tropomyosin
Pen a 1
Housedust-Mite
Seafood
© Eric H Cheng - http://ech


Mosquito allergy

Local reaction

f (Host)

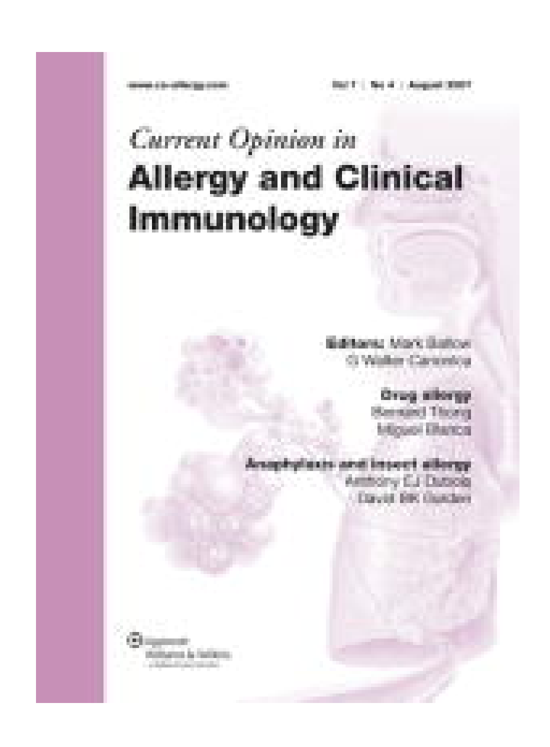
f (Mosquito)



You don‘t feel the sting

Only the reaction





Advances in mosquito allergy.

Peng, Zhikang; Simons, F
Current Opinion in Allergy & Clinical Immunology. 7(4):350-354, August 2007.

Mosquito allergy:

Allergens are in the saliva

Table 1 ***Aedes aegypti*** **salivary proteins**

Protein name	Allergen name	Molecular weight (kDa)	cDNA sequenced	Biological functions
α-Amylase 1		81.5	Yes	Unknown
apyrase	Aed a 1	68	Yes	Antiplatelet
α-Glucosidase (maltase-like 1)	Aed a 4	67	Yes	Sugar digestion
Esterase		65		Unknown
Anticoagulant-factor Xa		54	Yes	Anticoagulant
Aed a X_1	Aed a X_1 ?	44		Unknown
Aed a X_2	Aed a X_2 ?	37		Unknown
Female-specific protein, D7	Aed a 2	37	Yes	Unknown
	Aed a 3	30	Yes	Unknown
Sialokinins		1.4	Yes	Vasodilator
Antitumour necrosis factor		Unknown		Antitumour
Lysozyme		Unknown		Bacteriolysis

Reproduced from Peng and Simons [1].

Peng, Zhikang; Simons, F
Current Opinion in Allergy & Clinical Immunology. 7(4):350-354, August 2007.

Mosquito Allergy

History Mostly large local reactions
Systemic allergic symptoms < 3%

Skin test Extracts (Com. Available, Sens +/-)
Recombinant allergens

IgE ELISA **>**ImmunoCAP

Therapy Symptomatically
Prevention (Repellents, Long sleeves
SIT with WBA

Feng Curr Opin Allergy Clin Immunol 2007
McCormack Ann Allergy 1995

Mosquitoes as sources of inhalant allergens: Clinicoimmunologic and biochemical studies

236 patients in North-India with Asthma

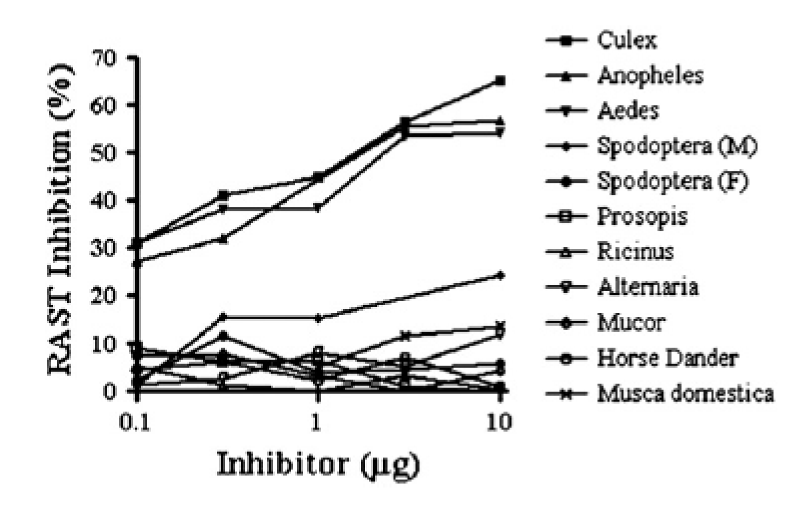
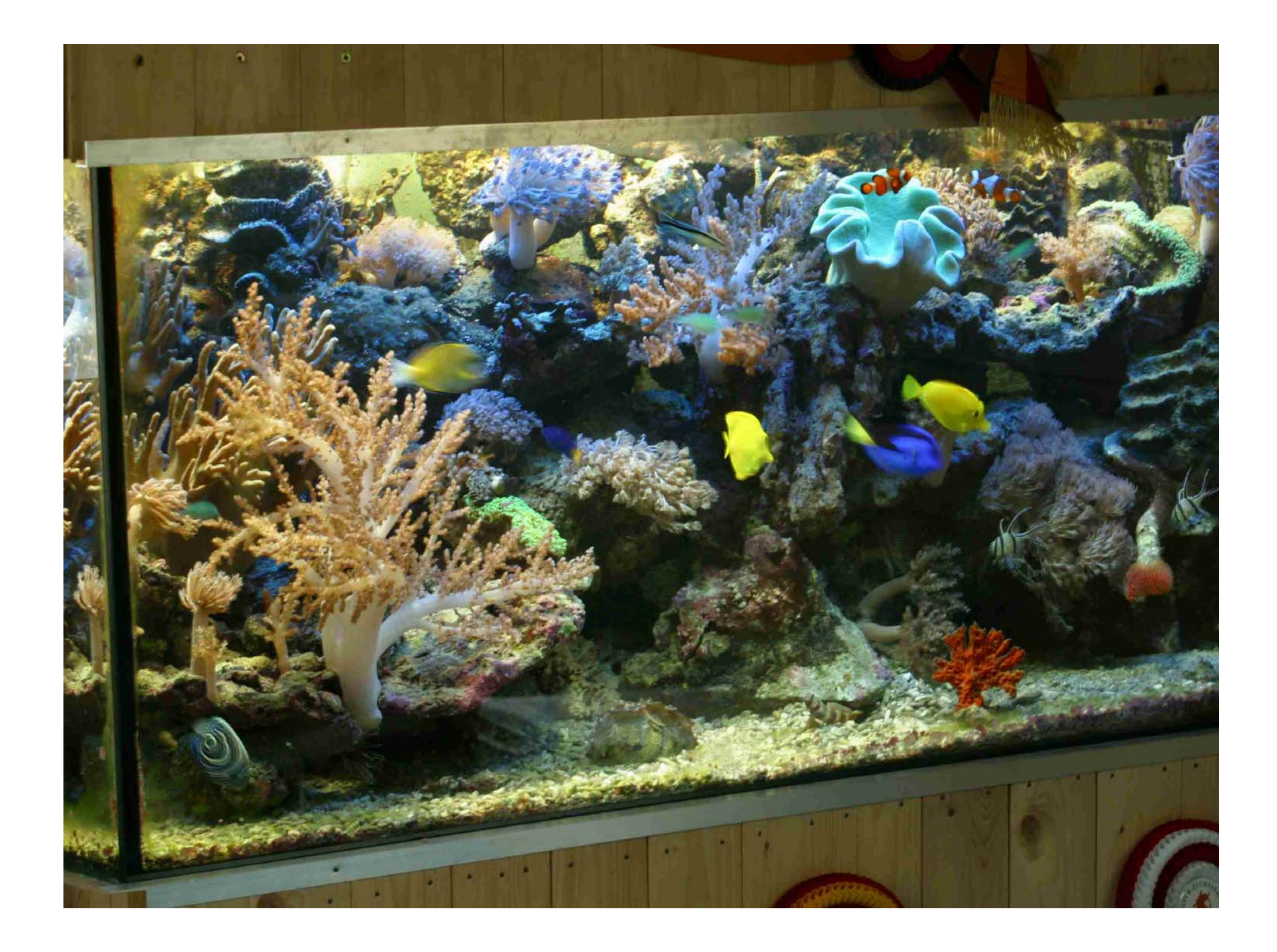


FIG 1. Inhibition of mosquito *(C quinquefasciatus)* RAST results with homologous *(C quinquefasciatus)* and the 2 heterologous mosquito WBEs (*A aegypti* and *A stephensi*) and 8 unrelated allergen extracts.

Kausuar J J Allergy Clin Immunol 2009




sera
omnipur S
costapur F
baktopur
mycopur
oodinopur
fishtamin
raffy Vital
PFLANZENFUTTER
PLANTENVOER
sera
holiday
O-nip
viformo
vipachips
Wels-Chips
sera
goldy
goldy Color
goldy Royal
GVG-mix
FD Tubifex
Flocken-Menü
san
flora
vipan
HAUPTFUTTER
by Zoopalaestchen


sera
sera
Expanding The Aquasphere
www.stoffelsinternational.nl
STOFFELS
international b.v.
Ergänzungsfutter für Zierfische
Supplemental food for ornamental fish
Aliment supplémentairs congelé pour poissons
ROTE MÜCKENLARVEN
RED MOSQUITO LARVAE
VERSE DE VASE ROUGES
VITAMIN PLUS
Zur Förderung von Vitalität und Abwehrkraft angereichert mit Spurenelementen, Vitaminen, Omega-3- und anderen ungesättigten Fettsäuren
Stimule la vitalité et augemente les defenses. Enrichit en oligo-éléments, vitamines, Omega-3 et autres oudes gras insaturés
Mindestens haltbar bis
Best before
Date limite de consommation
8 886345 129550
Art.-Nr. 36101
Inhalt Contents Poids net 100g e
Lagertemp. Store at A conserver à -18°C
Analysis (min.) Composition : Rohprotein Crude Protein Protéines 4,80% Rohfett Crude Fat Lipides 0,70% Rohfaser Crude Fiber Fibres 0,40% Feuchtigkeit Moisture Humidité 92,60% Asche Ash Cendres 1,00%
Nicht für den menschlichen Verzehr geeignet / Impropre à la consommation humaine
by Zoopalaestchen


sera
vipan
sera
flora
sera
GVG-mix
sera
san
Red mosquito larvae

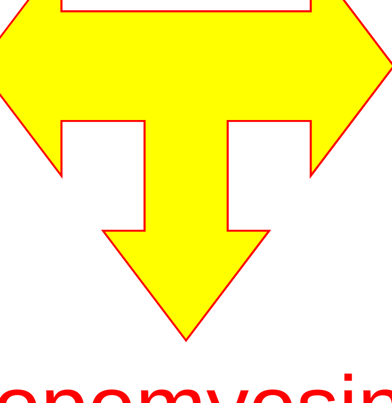
Allergy against
Red mosquito larvae

History	Feeding fishes, Preparing fish food
Skin test	Extracts (Not com avail)
IgE	ImmunoCAP
Therapy	Symptomatically Change of fish food

Gallindo PA J Investig Allergol Clin Immunol. 1998

Crossreactivity







Tropomyosin

Pen a 1 u.a.

Red Mosquito larvae

Cockroaches

Chironomids





Housedust-Mite

Johansson E Allergy 2001

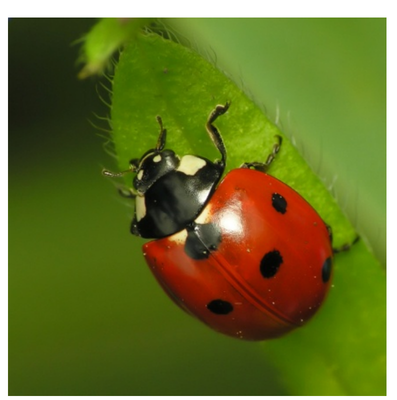
Insect bites and stings



Most common allergens



iRFA






Danke schön
Merci
Gracias
Thank you
Grazie
peter.schmid@usz.ch